

DOCUMENT RESUME

ED 235 773

IR 010 839

TITLE Evaluator's Guide for Microcomputer-Based Courseware.
INSTITUTION Alberta Dept. of Education, Edmonton.
PUB DATE [81]
NOTE 33p.
PUB TYPE Guides - Non-Classroom Use (055) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Computer Assisted Instruction; *Computer Programs; Content Analysis; Course Content; *Evaluation Criteria; Evaluation Methods; *Instructional Design; *Instructional Materials; Questionnaires

IDENTIFIERS *Software Evaluation

ABSTRACT

Designed to assist teachers in identifying quality software, this guide provides software evaluation forms and associated evaluation criteria to aid in completing the forms. The two-part instrument is used in the evaluation process conducted by Alberta Education, which involves the Program Development Division and the Computer Technology Project's Clearinghouse. A brief overview describes this process and the instrument itself, which consists of a program evaluation form and a disk evaluation form. Specific instructions and criteria are then provided for completing each section of the form. Under program evaluation, subsections cover program objectives, contents, instructional design, and technical design. The disk evaluation form includes source information, required hardware and software, management system, and ease of use. Also included are guidelines for making recommendations, the necessary features of tutorial/drill programs, definitions, and a glossary of terms. (LMM)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

- ▼ This document has been reproduced as received from the person or organization originating it.
- Minor changes have been made to improve reproduction quality.
- Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

EVALUATOR'S GUIDE
FOR
MICROCOMPUTER-BASED
COURSEWARE

DEVELOPED BY THE
PROGRAM DEVELOPMENT DIVISION
OF
ALBERTA EDUCATION
11160 JASPER AVENUE
EDMONTON, ALBERTA

"PERMISSION TO REPRODUCE THIS
MATERIAL HAS BEEN GRANTED BY
W.P. Eddy

ED235773

IR010839

TABLE OF CONTENTS

	PAGE
I. INTRODUCTION	
A. PURPOSE	1
B. PROCESS	1
C. DESCRIPTION OF THE INSTRUMENT	2
II. PROGRAM EVALUATION FORM	
A. INTENTS	3
B. CONTENT	3
C. INSTRUCTIONAL DESIGN	6
D. TECHNICAL DESIGN	11
III. DISK EVALUATION FORM	
A. DESCRIPTION	13
B. MANAGEMENT SYSTEM	14
C. EASE OF USE	15
D. DISK EVALUATION	15
E. SUMMATION	15
IV. GUIDELINES FOR MAKING RECOMMENDATIONS	16
V. NECESSARY FEATURES OF TUTORIAL/DRILL PROGRAMS	18
VI. DEFINITIONS	20
VII. GLOSSARY OF TERMS	21

Acknowledgment is given to the Northwest Regional Education Laboratory and the EPIE Institute for their work done in preparing evaluation instruments and guidebooks. We benefited considerably from their experience.

I INTRODUCTION

A. PURPOSE

Except in instructional situations where student programming is the primary activity, microcomputers can be used to assist the instructional process effectively only to the extent that quality software is available. This Evaluator's Guide and the associated evaluation forms have been designed to assist teachers in identifying such software.

The development of the guide and the evaluation instruments have been based on the philosophical approach that description and evaluation of courseware should be separated. This has been done in the three major sections of the instrument - CONTENT, INSTRUCTIONAL DESIGN AND TECHNICAL DESIGN.

B. PROCESS

The process of evaluation conducted by Alberta Education involves the Program Development Division and the Computer Technology Project's Clearinghouse. As priorities are identified by the Program Development Division, the Clearinghouse solicits courseware from publishers for evaluation. It then has the materials described and assessed by teachers who have the appropriate knowledge in the subject area under consideration and who have received training in the use of the evaluation instrument.

These evaluations result in one of three decisions:

- a. The material is identified as worthy of further evaluation.
- b. The material is identified as having limited use in the classroom (Supplementary).
- c. The material is rejected.

Courseware identified in "a" is evaluated further by the Program Development Division for congruency to the program of study and may be designated as a "Prescribed", "Recommended" or "Supplementary" learning resource for Alberta schools. Prescribed and Recommended materials are acquired and distributed through an agency identified by Alberta Education. All courseware evaluations are filed in the Clearinghouse and results are made available to Alberta schools.

C. DESCRIPTION OF THE INSTRUMENT

Courseware currently being published may come in a number of configurations.

- a. A disk may contain a number of "stand-alone" programs. For example, programs on spelling, identification of capital cities and review of basic number facts may be available all on one disk.
- b. A disk may contain a number of programs tied together under the same basic goals but each having different objectives. For example, a disk may have four programs - addition, subtraction, multiplication and division of decimals.
- c. A disk may contain one main program, for example, a simulation of a scientific experiment.
- d. Two or more disks may be tied together into a package or series. For example, six disks reviewing arithmetic fundamentals may be combined together into a single package with a management system.

As the basic item of purchase is the disk, IT IS THE DISK which has been made the basis of evaluation of this instrument.

There are two parts to the evaluation instrument - the PROGRAM EVALUATION FORM and the DISK EVALUATION FORM.

A PROGRAM EVALUATION FORM is generally completed for each stand-alone program on the disk. The form has descriptions and evaluations of a program's intents, content, instructional design and technical design. Each stand-alone program on the disk receives an evaluation that is independent of other programs on the disk.

A disk containing a number of programs tied together under a common goal will generally have each of the programs evaluated separately. However, when the programs are designed in such a manner that the only noticeable difference is the content and all other factors of instructional design and technical design are identical, one Program Evaluation Form may be used for all the programs.

A DISK EVALUATION FORM is used to evaluate the overall DISK. It contains the identification of the disk (title, publisher, etc.), and a description and evaluation of any management system that may exist. It also contains a summative evaluation of the disk's entire contents, instructional design and technical design. A summational statement and a recommendation are at the end of the form.

II PROGRAM EVALUATION FORM

A. INTENTS

OBJECTIVES

List the objectives that the program is intended to achieve and indicate if they are stated or inferred.

Objectives are the behaviours that the learner manifests as a result of involvement with the materials. The evaluator should ask himself what it is the learner will be able to do after using these materials?

Examples of objectives: Learners will be able to add fractions with common denominators; learners will be able to recognize the names of the capital cities of Canada; learners will be able to identify the correct use of "their, there and they're"; learners will be able to identify the chemical elements given the abbreviations of the elements.

B. CONTENT

PROGRAM CONTENTS

Describe the educational contents of the program (topics, skills, concepts).

1. What are the topics/skills/concepts covered in the program? (range)
2. What is the progression of the presentation? How are the units ordered? (sequence)
3. How intensively is each dealt with? What does the treatment include? (explanation, rules, examples, illustrations, drills, tests, etc.)

Example: This program covers three types of addition of fractions. Students begin with addition of common fractions with the same denominators, proceed to addition of fractions where one fraction has a denominator that is a factor of the other (2 and 6, 3 and 12) and finish the program with addition of fractions with completely different denominators (3 and 4, 5 and 7). Improper and mixed fractions are not included in the program. The presentation of each topic includes one page of introduction, two examples and a brief drill. A statement of rules is available. The program ends with a test on all three skills.

Example: This program covers three types of improper word usage:

1. there/their/they're
2. too/to/two
3. good/well

Each example is presented through the use of a rule, one example of correct usage and one example of incorrect usage. A drill of all three types is included at the end of the programs.

USER
SUPPORT
MATERIALS

User-support refers to STUDENT support materials.

1. Describe the extent of any student materials such as pre-instruction activities, work sheets and follow up activities that are included with the disk.
2. Indicate if the materials are integral to the design of the package or if they are optional.

CONTENT
EVALUATION

Write a narrative statement which will evaluate the content described earlier. Some questions to be addressed include:

Range

1. Is the range of the content appropriate for the target audience?
2. Is the range of the content effective in achieving the intents of the program. Is sufficient content covered? Is too much covered?

Sequence

3. Is the sequence of presentation appropriate for the target audience? Is the size of the increment appropriate?
4. Is the sequence effective in achieving the intents of the program?

- Depth
5. Is the depth appropriate for the target audience?
 6. Is the depth effective in achieving the intents of the program?
 - Is the material presented in sufficient depth and intensity so that learning will take place?
 - Are definitions and explanations available where necessary?
 - Are sufficient examples and illustrations used?
 - Is sufficient practice available?
- Accuracy
7. Is the content accurate? Does it contain factual errors, an invalid model in a simulation, an oversimplified model or series of examples, inaccurate graphs or displays?
 8. Is the content current?
- Clarity
9. Is the content presented in a clear and concise manner which is appropriate for the target audience?
- Bias
10. Does the content include biased information?
 - e.g. improper language usage?
 - e.g. ethnic or social class references?
 - e.g. references to violence?
 - e.g. references to sexual or social roles?
 - e.g. age portrayals?
 - Does it contain Canadian data where relevant?
 - Is content metricated?
- Curriculum
11. Is the content appropriate to the Alberta curriculum?
- User Support Materials
12. Are user support materials appropriate for the target audience?
 13. Are user support materials effective?
 - Do they contribute to the learning process?
 - Are these materials sufficient?

C. INSTRUCTIONAL DESIGN

INSTRUCTIONAL TECHNIQUE

Check the appropriate box(es). A definition of terms is included at the end of the guidebook.

STUDENT INTERACTION

Describe the student interaction that is required in the program.

1. How much student interaction is there?
2. What type of student interaction is there?
(multiple choice entry, input of answer, "press return", etc.)

Example: Student interaction in this program consists of "press space bar" instructions at the bottom of each page (approximately 25) and the input of the number of the correct response (1-4) in the drill section. (5 questions)

Example: Student interaction in this program consists of selection in the menu, page turning devices and input of answer in the drill section. In the menu, the student is asked to enter the name of the program section desired. During the explanation, (10 pages), the student can go forward or backwards by using the right or left arrow keys. The drill questions require the student to enter the correct answer along the % sign.

FEEDBACK TECHNIQUES

Describe the feedback techniques. Some questions that may be answered are:

1. When is feedback provided? (after all user responses, when user response is wrong, randomly on correct responses, etc.)
2. What type of feedback is provided? (e.g. graphics, text, audio, combinations, etc.)
3. What content is included in the feedback? (e.g. general message, specific hints depending upon the error, the correct answer, a restatement of the correct answer, explanation of incorrect response, etc.)
4. What is the extent of the variety of the feedback? (e.g. the same phrase "try again" is used after each incorrect response)

. . . 7

5. Is quantitative feedback provided? (You got 9 questions correct out of 20)

Example: There are two types of feedback employed. On inputting a correct answer, the student receives a brief congratulatory message chosen randomly from approximately 10 statements. If an incorrect response is entered, the student is first told to "try again". If, on the second attempt, he is still wrong the correct answer is given. Quantitative feedback is available at the end of the drill.

Example: Graphical and audio feedback are employed throughout the program. Correct answers are rewarded with a complicated graphical picture (4 pictures available). Incorrect answers are punished by a large X which flashes on and off the screen. At the same time, a loud buzzing noise advises the user that a mistake has been made.

EVALUATION TECHNIQUES

Describe the evaluation techniques that are used to determine the student's success in the program?

1. Is there a pre-test or a post test?
2. What are the criteria for success? Who sets the criteria?

Note that within this context, a drill is not a test. A drill presents questions, often in a structured way, to give the user practice in a particular skill. Often, more than one attempt at a question is given and hints may also be provided.

A test determines if the practice of the skill, the involvement of the student in the program, has been or is likely to be successful. Questions are not structured to lead a student towards more difficult questions, only one chance is given and feedback is limited to an indication of right or wrong.

BRANCHES

Describe the branches that exist within the program. What types of branches are available to the user? Is the program linearly sequenced or is there provision for review, remediation, enrichment, help, etc.?

TYPES OF CONTROL

Describe the type of control that is used with each of the following: Sequence, Rate and Amount.

There are three types of control - PROGRAM, TEACHER and USER. Program control is based on pre-set criteria built into the program while teacher and user controls are based on entries made during the operation of the program by either the teacher or the student (user).

Sequence refers to the order of the presentation, the path of the user through the branches described above. Under what circumstances does the user enter these branches? For example: Sending a student to a remedial loop automatically if he makes a certain number of errors is program control. User control gives the student the opportunity to go to a particular part of the program, e.g. skip the explanation and go straight to the drill. Teacher control allows the teacher to specify, before a student begins the program, what parts of the program he is to do.

Rate refers to the pace of the presentation, the time allowed to read each display and to answer questions.

Amount refers to the amount of material that is presented in any one branch and how it is controlled. For example, the number of questions done, the number of examples seen, the number of pages read or re-read.

Example:

Sequence-User: The student may elect to skip the instructions and go directly to the drill.

Rate-User: The pace is controlled by pressing the space bar.

Amount-Program: All students do 20 questions in the drill. If the instruction section is chosen, all students see the same number of examples and the same number of pages.

INSTRUCTIONAL
DESIGN
EVALUATION

Write a narrative statement which will evaluate the instructional designs described earlier. Some questions to be addressed include:

Instructional
Technique

1. Is the instructional technique appropriate for the target audience?
2. Is the instructional technique effective?
Is it appropriate for the intents of the program and the composition of the content?

Student
Interaction

3. Is the student interaction appropriate for the target audience?
 - Is the type of interaction appropriate?
 - Does the time required to complete the program exceed the attention span of the intended users?
4. Is the student interaction effective?
 - Is there sufficient interaction to meet the intents of the program? Does the student participate or just watch?
 - Is a consistent type of interaction used?

Feedback
Techniques

5. Is the feedback appropriate to the target audience?
6. Is the feedback effective?
 - Are user inputs accurately evaluated as right or wrong?
 - Does the feedback distinguish between a wrong answer and the wrong format?
 - Is the feedback non-threatening, immediate and positive?
 - Is the feedback corrective when necessary?
 - Is the feedback relevant to a student's responses?
 - Are traps set to catch potential errors of any kind?
 - Does the feedback explain why a response is wrong?
 - Are cues or prompts used after a wrong response?
 - Is the feedback to a wrong response unnecessarily attractive?
 - Can the user or the teacher control the feedback (e.g. type, amount, when given)?

Evaluation
Techniques

7. Is the evaluation technique appropriate to the target audience? Are the criteria for success appropriate for the ability/skills of the intended user?
8. Are the evaluation techniques effective?
 - Is the absence/presence of a post test appropriate to the intents of the program?
 - If present, does the test measure the user's achievements on all the intents?
 - If present, does the test content accurately reflect the content of the material presented?

Branches

9. Are the branches appropriate to the target audience?
10. Are the branches effective in accommodating individual differences? Should there be more? less?

Types of
Control

11. Are the types of control appropriate to the target audience and are they within their capabilities?
 - sequence?
 - rate?
 - amount?
12. Are the types of control effective? Does the user have control of the program when necessary? Can the teacher control the program when necessary?

D. TECHNICAL DESIGN

COLOUR, SOUND GRAPHICS

Describe the extent to which colour, sound and graphics are used. (Indicate if the evaluation was done without a color monitor)

TECHNICAL DESIGN EVALUATION

Write a narrative statement which will evaluate the technical quality of the program. Some questions to be addressed include:

Displays

1. Are displays appropriate for the target audience?
 - Are vocabulary, sentence structure, sentence length, character size and general readability appropriate?
2. Are displays effective?
 - Are they free from grammar, spelling, punctuation and hyphenation errors?
 - Is the amount of material presented at one time appropriate?
 - Is the material clear and easy to read? Is text material too lengthy or wordy? Is there adequate spacing for clarity?
 - Do message design principles place emphasis where the important concepts are? Is scrolling used appropriately so that pertinent information is retained on the screen?
 - Is the transition from display to display smooth, well paced and unobtrusive? Is the user given too little/too much time to read and absorb the information given in each display?

PROGRAM NAME(S):

INTENTS

OBJECTIVES: _____ Stated _____ Inferred Describe the objectives
(Guidebook, page 3)

CONTENT DESCRIPTION

Describe the program contents: (Guidebook, page 3)

Describe user support materials (if any): (Guidebook, page 4)

CONTENT EVALUATION (Guidebook, page 4)

INSTRUCTIONAL DESIGN DESCRIPTION

Check the appropriate instructional technique(s) used and comment if necessary:

☐ Drill and Practice ☐ Tutorial ☐ Simulation ☐ Game
☐ Other (specify)

Describe the student interaction in the program: (Guidebook, page 6)

Describe the feedback techniques used in the program: (Guidebook, page 6)

Describe the evaluation techniques used in the program: (Guidebook, page 7)

Describe the branches available in the program: (Guidebook, page 7)

DESCRIPTION

Disk Title: _____	Version: _____
Series Title: (if applicable) _____	Cost: _____
Producer: _____	
Address: _____	Programs Included in this Evaluation
_____	_____
_____	_____
_____	_____
Telephone No.: _____	_____
Subject Area: _____	_____
Topic(s) _____	_____
_____	_____
_____	_____
Specified Users: _____	Other Components Included in Package:
_____	_____
Required Hardware and Software:	_____
(in addition to an Apple II, 48K, Applesoft,	_____
1 Disk Drive, DOS 3.3, B&W Monitor)	_____
_____	Available in languages other than English?
_____	☐ No ☐ Yes - (specify)
_____	_____
_____	_____

MANAGEMENT SYSTEM DESCRIPTION (Guidebook, page 14)

Is a management system available on this disk? _____ on another disk? _____
Describe the functions available: (if any)

EASE OF USE

Describe any special prerequisites:

How difficult/easy is it for a teacher to use the disk?

DISK CONTENT EVALUATION (Guidebook, page 4)

DISK INSTRUCTIONAL DESIGN EVALUATION (Guidebook, page 9)

DISK TECHNICAL DESIGN EVALUATION (Guidebook, page 11)

DISK EVALUATION: SUMMATONAL STATEMENT: MAJOR STRENGTHS AND WEAKNESSES

RECOMMENDATION

I recommend that _____ this disk be evaluated further to determine the full nature
of its use. (Prescribed or Recommended)
_____ this disk be considered for supplementary use in the classroom.
_____ this disk be rejected.

I agree that the copywrite to this report rests with Alberta Education and confirm that
no attempt was made to copy or modify the program or the accompanying documentation.

Check here if observations
of student use were
incorporated into this
evaluation _____.

Name of evaluator: _____

Signature: _____

Describe the capacity:

MANAGEMENT SYSTEM EVALUATION (Guidebook, page 14)

Describe the types of control in the program: (Sequence, Rate, Amount)
(Guidebook, page 8)

INSTRUCTIONAL DESIGN EVALUATION (Guidebook, page 9)

TECHNICAL DESIGN DESCRIPTION

Describe the use of colour, graphics and sound in the program: (Guidebook, page 11)

TECHNICAL DESIGN EVALUATION (Guidebook, page 11)

ADDITIONAL COMMENTS

Colour
Graphics
Sound

3. Are colour, graphics and sound appropriate for the target audience?
4. Are colour, graphics and sound used effectively?
 - Are they used appropriately for the content material?
 - Is there an option for the use/non-use of sound? Will the sound distract others in the classroom?
 - Are they appropriately mixed with text so as to give variety to the presentation?
 - Are the graphics boring? repetitive? too slow?
 - If colour is present, will the program be effective on a non-colour monitor?

Ease of Use

5. Can the intended user easily and independently operate the program?
 - Does the operation of the program interfere with the user's concentration?
 - Is it possible to get lost in the program with no way out?
 - Are instructions available at likely points and are they appropriate for the target audience?
 - Can the user exit the program, return to the menu or move to another section easily when necessary?
 - Is the program reliable and bomb-proof under normal use?

III DISK EVALUATION FORM

A. DESCRIPTION

This section will be completed by the Clearinghouse. Some of the sections are described below.

Series Title	If the disk being evaluated is part of a series, the name of the series will be entered here (e.g. Milliken Math Sequences).
Version	Version number or date of publication.
Cost	The most recent cost as provided by the publisher. This is subject to change without notice by the publisher.
Publisher Address Telephone	The original source who produced the package. A telephone number is provided (if possible) so that schools may contact the publisher in order to determine if there is a Canadian distributor.
Specified Users	Grade level, grade range or other ability level indicators for which the package has been specifically intended.
Required Hardware & Software	Hardware or software beyond the standard package of 48K, 1 disk drive, 3.3 DOS, B&W monitor.
Programs Included	A list of titles of each program on the disk. One Program Evaluation Form will generally be completed for each title.
Other Components	Other components which are included in the package such as a management system, student workbooks or a teacher guide.

B. MANAGEMENT SYSTEM

FUNCTIONS DESCRIPTION

Describe the functions available in the management system. These may include:

Class lists: e.g. initiating, maintaining, adding to, deleting from;

Reports: e.g. by individual student, by class, by specific unit;

Prescription: e.g. prescription of specific assignments or a range of assignments for individuals or for the class;

Diagnosis: diagnosis of a student's weaknesses; and

Security: passwords, etc.

CAPACITY

How many students can be kept in one class? How many scores can be kept for one student? How many classes can be kept?

EVALUATION

Write a narrative statement which will evaluate the effectiveness and the ease of use of the management system. Some questions to be addressed include:

1. Do the functions work as described?
2. Is the system effective in meeting the needs of the teacher?
3. How easy is the system to set up and use?
4. Is the capacity sufficient?
5. Is data easily and effectively collected?

C. EASE OF USE

PREREQUISITES

Describe any special prerequisites that are required beyond the normal grade level skills.

TEACHER USE

Evaluate how difficult/easy it is for a teacher to use the package. Consider the amount of documentation and support that comes with the package both inside and outside of the program. Some questions to be considered are:

1. Can a teacher control the pace/difficulty if desired.
2. Do the students require a minimum amount of teacher supervision when using the program?
3. Are error handling and identification procedures sufficiently detailed so that a teacher can help a student?
4. Is the disk adaptable to a variety of classroom learning environments?
5. Does the disk require a minimal amount of equipment manipulation?
6. Can the disk be used by a teacher with a minimum of computer competency?

D. DISK EVALUATION

Evaluative statements in this section cover the entire disk. If there is more than one program on the disk and if two or more Program Evaluation Forms have been completed, this section will include summaries of the evaluative comments made on those forms. If only one Program Evaluation Form has been completed, the reader should be referred to evaluation statements made on that form.

Disk Content - see page four of this guidebook

Disk Instructional Design - see page nine of this guidebook

Disk Technical Design - see page eleven of this guidebook

E. SUMMATION

EVALUATION SUMMARY

Summarize the strengths and weaknesses of the disk. Considering the comments made in the sections above, what is your evaluation of the entire disk?

RECOMMENDATION

Check one recommendation. See the guidelines for making recommendations on page sixteen and the necessary features of tutorial/drill programs on page 18.

IV GUIDELINES FOR MAKING RECOMMENDATIONS

There are no hard and fast rules with which to equate the strengths and weaknesses of a disk to "the correct recommendation". Recommendations are subjective and will vary from one evaluator to another. We hope that the degree of variance will be small and that the process of forming a synthesis from three evaluations will minimize any differences that might occur.

However, to keep these variances small and to strive for consistency across subject and grade levels, it would be advantageous to consider some guidelines.

Within this instrument, there are two questions which have been addressed in almost every evaluation section: 1. the appropriateness to the target audience, and 2. the effectiveness in meeting the intents of the program. A program that is ineffective should be rejected. On the other hand, a program which is inappropriate to its target audience may still be effective for another target audience and could be considered for limited use (supplementary) in the classroom.

What makes a program ineffective or inappropriate? Certainly the degree of the weakness has to be considered. A program should not be rejected because of a minor flaw. The number of weaknesses should also be considered and a program with 4 or 5 minor flaws may have its use restricted because of the cumulative effects of small weaknesses.

Major flaws are those which seriously hinder the learning that is supposed to take place in a program. They are generally in the areas of "content" and "instructional design". Minor flaws are those which may slightly detract from the programs effectiveness. They are generally in the area of "technical design" or are weaknesses in meeting the needs of the specified users. One minor flaw by itself is not necessarily cause for a lower rating. Several minor flaws should result in a supplementary status and more than 5 (arbitrary figure for the sake of establishing a line) should be cause for rejection.

Examples of major flaws:

1. The sequence of the presentation is ineffective. The program may "hop around" dealing with concepts in a disorganized fashion.
2. The sequence of the presentation may completely miss an important concept which makes all further explanations confusing to the student.
3. The depth of the content may be ineffective. Generally this will happen if the concepts are not given sufficient depth of treatment, e.g. one page is given when three are necessary. As a result, the various topics are presented too rapidly and the user has too much material to assimilate at one time.

4. The depth of the content does not include any (or sufficient) practice.
5. There is insufficient student interaction in the program. Generally the program is a "page turner" or it has limited student interaction even in the drill section.
6. The program accepts incorrect answers or rejects correct answers.
7. Feedback does not go beyond indicating if the answer is right or wrong. There is no explanation available as to why an answer may be wrong.

Examples of minor flaws:

1. Material on the screen is cluttered, poorly displayed.
2. Minor spelling or grammatical errors.
3. Insufficient user support materials.
4. Student interaction is not consistent between pushing return or pushing the space bar.
5. Student is not able to control the number of questions in a drill.
6. Sound is distracting.
7. Graphic displays are too slow.
8. Definition of characters is hard for elementary students to read.
9. Language is too difficult for the intended users.

V NECESSARY FEATURES OF TUTORIAL/DRILL PROGRAMS

The following should be considered as minimum requirements for tutorial and drill and practice programs. Except in exceptional cases, programs which do not have all seven features described below should be rejected.

1. Orderly Structure

Questions should be posed in an orderly progression so that the student can learn from the drill. This may be achieved by formatting the material into distinct units or by leading the student through a steadily more difficult series of tasks. Drills which "hop around" or which have "quantum leaps" between the tasks should be rejected.

2. Randomization

A student should be able to redo the drill a number of times. Ideally, the questions should be different each time. If the nature of the material is such that this is impossible, the questions should be drawn from a bank of questions and should be presented in random order.

3. Appropriate Interaction

In a tutorial, there should be some interaction between the program and the user.

In a drill, a user will be inputting answers but the type of interaction can limit a drill's effectiveness.

a) Multiple choice questions can be ineffective if the user can easily guess the answer without having to do the question. For example, in the problem 10048 minus 2197, all alternatives should have a "1" in the last place. If only one answer does, it can be correctly selected without actually doing the question.

b) Some interactions test the student's ability to type rather than knowledge of the material.

e.g. having to type in long, complicated words; timed questions where words or long involved numbers have to be entered; allowing a user only one attempt at a question.

4. Immediate Feedback

The student should be made aware immediately if he/she is right or wrong. Passing the student on to the next question in a drill after a correct answer has been entered is appropriate if the student is aware that this is how correct answers are treated. If an answer is wrong, there should be some immediate indication that the student's response was wrong.

5. Accurate Feedback

Programs should accurately assess the student's input. This includes giving the correct answer as well as correctly evaluating a student's input. Ideally the program should also distinguish between an incorrect response and an incorrect format.

6. Quantitative Feedback

A program should give the student (and the teacher) the results at the end of the drill. Ideally, a user should also know how many questions there are in the drill and how many have been done.

7. Restructuring

When an incorrect response or a sequence of incorrect responses has been entered, the student's path through the program should be restructured in such a way that he/she learns why the answer was wrong. This is a critical element in instruction and unfortunately it is often missing in the courseware currently on the market. Something more should happen than telling the student what the answer should have been. Examples of restructuring are:

a) Corrective feedback; hints and cues which direct the student on a second attempt

b) Availability of help pages

c) Remedial loops; a student may be directed to a section of the program where further instruction is given (usually at a lower level) and/or where other drill questions lead the student through his/her weakness.

d) The program may loop back to a previous page and the student then continues from that point. This is not necessarily effective as the original explanation may be the reason for the confusion.

e) The level of difficulty may be changed. This can be effective if the student is brought back up to the desired level.

f) The number of questions may be increased or decreased depending upon the student's achievement.

VI DEFINITIONS

PRESCRIBED LEARNING RESOURCES are those "learning resources approved by the Minister as being most appropriate for meeting the majority of goals and objectives for courses, or substantial components of courses, outlined in provincial Programs of Study".

Evaluators do not have to make this recommendation- it is made by the Curriculum Committee. Evaluators just make the recommendation that the courseware is worth looking at by the Curriculum Committee.

RECOMMENDED LEARNING REOURCES are "those learning resources approved by Alberta Education because they complement Prescribed Learning Resources by making an important contribution to the attainment of one or more of the major goals of courses outlined in the provincial Programs of Study".

As with prescribed materials, evaluators only recommend that specific courseware be examined further. This examination may result in a prescribed status, a recommended status or even a supplementary status.

SUPPLEMENTARY LEARNING RESOURCES are "those additional learning resources identified by teachers, school boards or Alberta Education to support courses outlined in the provincial Programs of Study by reinforcing or enriching the learning experience".

Teachers may identify supplementary resources but this category should not be a dumping ground for all courseware that is less than "Recommended". Courseware in this category should still be effective, it should meet the needs of some target audience (perhaps not the target audience specified) and it should support some of the goals of the curriculum. The range of potential use of the courseware may be limited, but what it does cover, it covers effectively.

VII GLOSSARY OF TERMS

In the fields of microcomputers and education, terminology can easily be misinterpreted. So that everyone using the Guide will interpret words in the same way, a brief glossary is provided below. Each definition conforms to some standard use of the term but is not necessarily a composite of all uses nor the most common use.

Content	Facts, terms, ideas, concepts, principles, theories and constructs which make up the subject matter of an instructional package.
Courseware	Software and printed materials which support instruction in a complete course of study or a definite subset of a course. In this sense, it is not required that all instructional activities be supported by the package or that the tutorial mode of instruction be employed. Even a 30 minute student activity aimed at one objective can be courseware in this definition.
Documentation	Written material for the teacher to use with the computer program (also called a support booklet).
DOS	"Disk Operating System", an operating system which includes the capability of controlling and coordinating the functions of a disk drive within a computer system.
Drill & Practice Mode	A type of computer program which acts as drillmaster by providing repetitive practice on a skill or set of facts. The mode assumes that instruction in the concept skill or process has already been given. Ideally a drill and practice program should: 1) provide random selection of exercises; 2) record student progress; 3) tailor instructions, exercises and feedback to the individual; and 4) offer corrective feedback upon the input of incorrect responses.
Games	Programs in the instructional gaming mode call upon the user to apply one or more specific skills or concepts within a "game" environment. The game dimension of the environment includes the conditions of competition with self or others, specific (if arbitrary) rules, the need to develop a winning strategy and the introduction of random events to force revision of strategies. The instructional dimension of the environment demands that the development both of identifiable subject matter skills or concepts and of general problem solving skills be a goal of the exercise.
Graphics	Images displayed on a video screen or printer which are generated by a computer program.
Hardware	Equipment, including computers, disk drives, cassette players, cables and monitors.

Materials	Books, folders, envelopes, worksheets and similar items. "User Support Materials" are items which support the activity of a person using a computer program.
Microcomputer	A computer system, including peripheral hardware such as disk drive and monitor, based on a microprocessor (or "chip") and having a typewriter-like keyboard.
Package	One or more computer programs with related materials and the storage medium.
Problem Solver	A type of computer program which processes data for a student defined problem.
Program	A computer program, written in Basic, Pascal, machine code or other computer programming language. The routines and operations which instruct the computer.
Simulation	Programs in the simulation mode attempt to represent key aspects of some environment within which the user will experience the necessity of making decisions and will be informed of the results of his decisions without experiencing the real consequences of possible misjudgements. The time required to develop and use simulations is justified in situations where actual experience is ruled out due to extreme expense, safety consideration or the time required for the actual experience. Simulations include problem solving tasks (e.g. diagnosis of illnesses, genetic experiments, testing theoretical models), procedural tasks (e.g. acid titration, blasting, breeding of organisms), or performances (e.g. control of water pollution).
Software	Computer programs, including courseware, operating systems and languages.
Tutorial	For programs in this mode, the computer assumes the total responsibility for instruction. Tutorials are characterized by a dialogue between the student and the computer in which the direction and the level of the dialogue are shaped by the student's input. Ideally, tutorials should tailor and present instruction to the individual, introduce new concepts, provide exercises and tests, monitor student responses, give immediate reinforcement and corrective feedback, and keep records.

Some definitions in this glossary have been taken from Evaluator's Guide published by MicroSIFT and The Computing Teacher.